

ABSTRACT

A transmitter is provided for simultaneously transmitting a plurality of signals in a plurality of directive beams to corresponding destination stations, each destination station located in a separate fan within a service area. The transmitter includes a plurality of beamformers, each beamformer receiving one of the signals to be transmitted to an associated fan, each of the beamformers having a plurality of outputs for each different signal to be transmitted. A plurality of Butler matrices each receive one of the plurality of outputs from the plurality of beamformers for each different signal to be transmitted, each Butler matrix having a plurality of outputs in phased relationship to one another, wherein each of the signals to be transmitted is simultaneously provided across the outputs of each Butler matrix in a phased relationship. An antenna is provided with an aperture within which a two-dimensional array of antenna elements are disposed, wherein equal fractions of adjacent antenna elements are connected to the outputs of each Butler matrix, and wherein each of the plurality of signals are simultaneously transmitted by the entire two-dimensional array of antenna elements. Each of the plurality of beamformers receives steering control signals for steering the direction of each beam within its respective fan.